





With the Author's Remarks

ON

INCREASED THICKNESS OF THE PARIETES

OF ONE OF THE

VENTRICLES OF THE HEART,

WITH

DIMINUTION OF ITS CAVITY.

By GEORGE BUDD, M.B. F.R.S.

FELLOW OF CAIUS COLLEGE, CAMBRIDGE, AND PHYSICIAN TO THE
SEAMEN'S HOSPITAL, DREADNOUGHT.

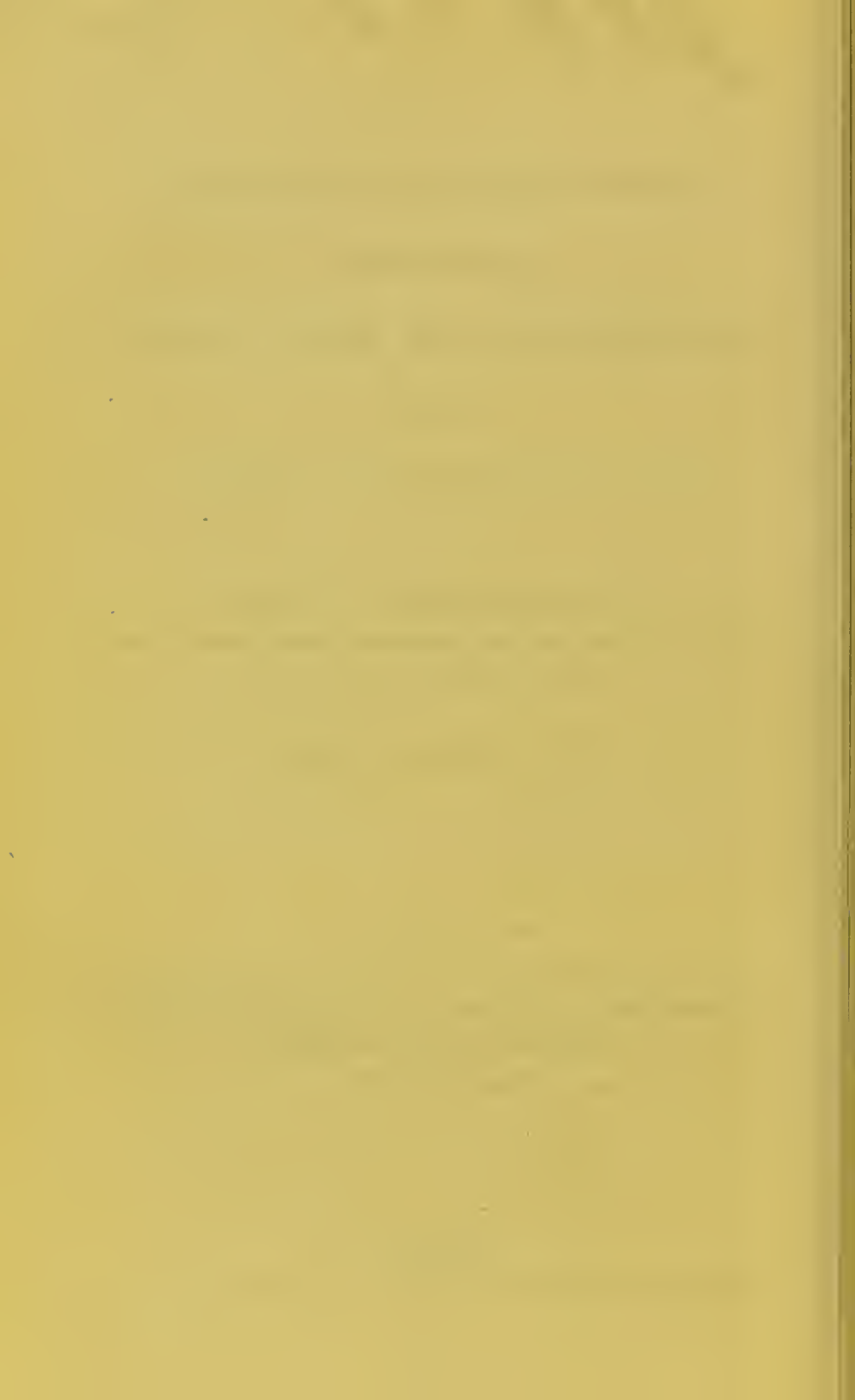
COMMUNICATED BY MR. PERRY.

FROM THE TWENTY-FIRST VOLUME OF THE MEDICO-CHIRURGICAL
TRANSACTIONS, PUBLISHED BY THE ROYAL MEDICAL AND
CHIRURGICAL SOCIETY OF LONDON.

London :

PRINTED BY G. WOODFALL, ANGEL COURT, SKINNER STREET.

1838.



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READ APRIL 10TH, 1838.

UNNATURAL thickness of the parietes of one of the ventricles of the heart, with diminution of its capacity, was first distinctly noticed, as one of the forms of hypertrophy of that organ, by M. Bertin, in 1811, and was by him designated "concentric hypertrophy." His observations have since been corroborated by those of other pathologists, and the existence of this condition has been generally acknowledged.

M. Cruveilhier, however, refuses to admit this form of hypertrophy, and gives a different explanation of the appearances which have sanctioned the designation, concentric hypertrophy. He says, "the

facts, which I have had occasion to observe, do not allow me to admit concentric hypertrophy: the obliteration of the cavity, and the proportionably increased thickness of the parietes, appear to me the result of the mode of death. The hearts of all those whom I have had an opportunity of examining, who died by the executioner, have presented this double phenomenon in the highest degree; the parietes of the ventricle were in contact at all points. I have made the same observation with regard to other persons who died a violent death. The hearts, concentrically hypertrophied, of the authors I have just quoted, (MM. Bertin and Bouillaud,) appear to me to be hearts, more or less hypertrophied, which death surprised in all their energy of contractility.”*

The dissent of so respectable an authority from the opinions of all physicians who have recently written on diseases of the heart, who have not only considered concentric hypertrophy as a pathological condition, but have even agreed in ascribing to it a peculiar catalogue of symptoms, has induced me to publish some cases of this affection that have fallen under my own notice, and to review those that have been recorded by authors, for the sake of ascertaining whether it must be considered a disease, or whether we must conclude, with M. Cruveilhier, that it is merely a passing condition of the ventricle.

* Dictionnaire de Méd. et de Chir. pratiques. Art. Hypertrophie.

CASE I.*

A man, 21, addicted to spirituous liquors, at sea since the age of 14, was admitted at St. Bartholomew's Hospital with cerebral symptoms, (delirium alternating with coma,) on the 19th of March, 1836. His breathing was somewhat stertorous and hurried; his pulse very feeble and rapid. There was no œdema or dropsy. He was reported to have had severe cough, with pain in the chest, which lasted some days, about a week before his admission. Death occurred in profound coma on the 21st.

Inspection, eighteen hours after death.—Heart larger than natural; internal and external membranes healthy; valves healthy; length of the left ventricle, (which formed almost 'the whole mass of the heart,) measured by a string wrapped on it, from the base to the apex, $5\frac{1}{2}$ inches. A transverse section of the ventricle was made at a distance from the apex of rather more than $\frac{1}{3}$ of its length; the thickness of the parietes of this section varied from 1 to $1\frac{1}{2}$ inch; the thickest portion corresponding to one of the columnæ carneæ, which column was nearly as large as the top of my fore-finger; the thickness of the parietes near the base from $\frac{6}{8}$ ths to $\frac{7}{8}$ ths of an inch. The cavity was not large enough to hold the second phalanx of the thumb; it was almost filled by the co-

* For the notes of this case during life, and the heart of the subject, I am indebted to my friend, Mr. Firth.

lumnæ. The mitral orifice was free ; the tendinous threads of the valve small and delicate, bearing no proportion to the massive state of the pillars. The right ventricle, perfectly natural in capacity and in the thickness of its parietes, reached to within $\frac{3}{4}$ ths of an inch of the apex. Both auricles natural ; the foramen ovale closed ; the aorta, throughout, very small ; its inner circumference, just above the valves, two inches. In this portion were some yellowish spots, particularly near the points of union of the sigmoid valves, which were thin and small. The heart, in its opened state, was put to macerate ; no force was applied to extend it. At the end of some days, on being folded up, it was found to have dilated very considerably, so that the left ventricle could not then be said to be smaller than natural.

CASE II.

A negro, 25, in good nutrition, who had been much exposed to cold, and whose toes were frost-bitten, was admitted into the Dreadnought, January, 1838. He presented febrile symptoms, but none that led us to suspect disease of the heart, and died unexpectedly a few days after admission. No information could be obtained from him, and no notes of his case were taken.

Inspection.—There was no œdema or dropsy. The heart, which was larger than natural, presented the appearance of concentric hypertrophy

of the left ventricle. The parieties of this ventricle were more than an inch in thickness; the cavity quite obliterated, but, by the forcible introduction of the fingers, I succeeded in dilating it to the usual dimensions. The point of the right ventricle more than an inch from the apex of the heart. No dilatation of the other cavities. The external and internal membranes of the heart, and the valves, quite healthy. No malformation. No disease of the aorta.

CASE III.

A woman, aged 60, affected with senile gangrene of the left foot, and acute inflammation of the left knee joint, died in the Middlesex Hospital, on the 14th of November, 1836, and was inspected on the following day.

Great emaciation; no œdema or dropsy. Heart not larger than natural. A milky spot of the size of a shilling on the pericardium, which was otherwise healthy, and which contained a small quantity of serum. The cardiac veins were very serpentine. The left ventricle appeared solid; when cut into, the cavity could scarcely hold an almond; the parietes were very thick. No dilatation of the other cavities, or thickening of their parietes. All the valves healthy. The arteries much incrustrated; the aorta rather large: the left vertebral arose from the aorta between the carotid and subclavian.

CASE IV.*

A man between 60 and 70, tall and thin, subject to chronic cough, fell down in apoplexy, followed by paralysis and other cerebral symptoms, on the 31st of March, 1836. On the 1st of April, he was bled to $\bar{3}$ xvj. On the 2nd, the pulse was noted as rather quick and unsteady; the breathing stertorous. He died on the 3rd.

Inspection, twenty-four hours after death.—No œdema or dropsy. Cavity of the left ventricle so much contracted as only to admit one finger; its external paries, about the middle, thicker than the length of the second phalanx of the thumb. Right ventricle perhaps slightly dilated. Other cavities normal. Orifices and valves healthy. Depositions beneath the internal coat of the aorta; arteries of the brain extensively diseased. A coagulum in the right lateral ventricle proceeding from the corpus striatum, &c.

In the authors that I have consulted, I have met with fifteen cases of concentric hypertrophy. Of these, four presented very little, if any, obstacle to the circulation from valvular disease, and may, therefore, be classed with those I have just related; six offered considerable obstruction to the circulation from thickening and cartilaginous induration of the valves, and will be subsequently considered; in the remaining five, there were evident signs of congenital malformation of the heart, and I shall consequently refer them to a group apart.

* Recorded by my friend, Dr. Johnstone.

The case that I shall first mention is a very striking one : it is recorded by Laennec.

*CASE V.**

A man aged 67, tall, pale, and thin, entered the hospital the 22d of April, suffering from intense frontal headache ; his tongue was coated, and he was considered as labouring under a bilious affection without fever. The pulse was natural, the breathing perfectly free, and nothing, says Laennec, led me to suppose that this man had a disease of the heart ; he was considered infirm, rather than ill, and was on the point of leaving the hospital, when, on the 20th of May, a fresh group of cerebral symptoms made their appearance, and the patient died in the night of the 24th. As late as the 22d of May, the pulse was quite natural in frequency, development, and rhythm.

Inspection, thirty-six hours after death.—Body, pale and thin. The heart exceeded in volume both fists of the subject ; the right ventricle was small, its parietes thin, and it had the appearance of having been made (*pratiqué*) in the substance of the left. The left ventricle presented a cavity capable, at most, of containing an almond stripped of its shell ; the greatest thickness of the parietes $1\frac{1}{2}$ inch, the least thickness 1 inch, except towards the point of the heart, where it was at most two lines. One of the aortic valves presented three or four small excres-

* Laennec, Obs. 54.

cences, analogous to venereal warts of fleshy consistence, and very adherent to the valve. The arch of the aorta, dilated to the size of a moderate apple, was incrustated with osseous laminae. There was also an aneurism of the abdominal aorta, cerebral congestion, and an infiltration of transparent gelatinous serum into the cellular tissue of the pia mater.

CASE VI.*

A man aged 60. Death by apoplexy, two days after the attack. Beating of the heart very forcible. Pulse 100, small and narrow. No mention of œdema or dropsy.

Inspection.—The heart larger by a good third than natural; round, plump, blunt at the point. The left ventricle enormously hypertrophied; its cavity can scarcely hold the fore-finger; the greatest thickness of its parietes 13 lines; the columnæ carneæ exceedingly robust. The septum, 9 lines in thickness, projects into the cavity of the right ventricle, whose capacity is about natural; the greatest thickness of its parietes $3\frac{1}{2}$ lines. The mitral valves thickened, and spotted with yellow plates. The tissue of the heart of a bright red. The origin of the coronary arteries fibro-cartilaginous. The commencement of the aorta offers some yellow points and spots, rudiments of ossification. The arteries of the brain ossified. Two hæmorrhagic collections in the brain.

* Bouillaud, Obs. 128.

CASE VII.*

A woman, 40. Palpitations at intervals for eight years; occasionally accompanied, during her stay in the hospital, with sense of suffocation. Hemiplegia. Death occurring during erysipelas of the face, the palsy having existed about four months.

Pulse regular; not full, but hard and strong; pulsation of the left ventricle strong, concentrated, and dull. No œdema or dropsy.

Inspection.—Heart double the size of the fist of the subject. Left ventricle extremely robust; its parietes an inch thick in the middle, the thickness diminishing towards the base and apex; its cavity very sensibly contracted. Two auricles and right ventricle very nearly normal. Orifices healthy. Aorta small, and spotted with earthy concretions. Softening of several parts of the brain.

CASE VIII.

A woman, 52, tall and very thin, reporting herself habitually asthmatic. No other history. Death the day after admission.

Pulse noted 112, tolerably full and soft. Pulsations of the heart tolerably strong, accompanied by the usual double sound. Distension of the jugulars, particularly of the left. No œdema or dropsy.

Inspection.—Heart round and blunt. Milky spots on the upper and anterior part of the right ventricle. Thickness of the parietes of this ventricle very great,

* Bouillaud, Obs. 118.

especially under the spots, where it was more than four lines. Columnæ carneæ numerous, and forming a close network. Cavity of the right ventricle scarcely admitting the fore-finger. Cavity of the left, perhaps a little less capacious than natural. Other cavities not remarkable. Orifices and valves natural. Aorta, in its pectoral and abdominal portions, sprinkled with fibrous or fibro-cartilaginous laminae. Grey hepatization of the right lung; emphysema of the left*.

Here, then, we have eight cases, in which the appearances of concentric hypertrophy existed without complication of any considerable disease of the valves. In one of these only was any irregularity of the pulse noticed; in none was there dropsy; and in none, if we except Dr. Johnstone's case, in which there was a questionable dilatation of the right auricle, was there any dilatation of the right cavities. From this we may infer that the affection of the heart, in these cases, offered no considerable obstacle to the circulation through it. For when much obstacle exists, at least on the left side of the heart, there is generally intermittence or irregularity of the pulse, and almost invariably dilatation of the right cavities and dropsy.

(Of forty-one cases recorded in the works of Bouillaud and Corvisart, in which either the aortic or mitral orifice was contracted, exclusive of cases in which there was congenital malformation of the heart, twenty-seven presented intermittence or irregularity of the pulse; there are only five in which some degree of

* Bouillaud, Obs. 122.

dropsy was not noticed, and only three in which neither of the right cavities is said to have been dilated.)

By the absence, then, of these three conditions in the cases of concentric hypertrophy, we are justified in concluding that this affection, in the cases in which it has been observed uncomplicated with an obstruction at the valves, offered no obstacle to the circulation through the heart*.

But how can we reconcile this with the smallness of the cavity in these cases? It is impossible to conceive that a left ventricle, which could scarcely hold an almond, should offer no obstacle to the circulation through the heart. Yet in this very case, the day before death, the pulse was quite natural in frequency, development, and rhythm, and we have the word of the accurate Laennec, that there was no symptom of disease of the heart.

In another very marked case, the pulse was noted as tolerably full and soft. None of these patients died of disease of the heart; and in all, the symptoms which could have led one to suspect cardiac disease were slight, and no other than those which indicate simple hypertrophy †.

* This conclusion is in opposition to the opinion expressed by physicians who have noticed concentric hypertrophy, who have agreed in assigning to it the same symptoms as those which characterize contraction of an orifice.—(See Bertin, p. 359. Dr. Hope, Art. Hypertrophy, Cyclopaedia. Audral, Tom. I. ch. 2.)

† In the treatise of M. Bouillaud is recorded a case of simple hypertrophy of the left ventricle, (Obs. 113,) and one in which the left ventricle was slightly dilated and greatly thickened,

We must then, I think, conclude that in the cases which I have related, there was not really a contraction of the cavity during life ; but, to use the terms of M. Cruveilhier, that they were hearts, more or less hypertrophied, which death surprised in a state of contraction ; and this conclusion becomes imperative, when we consider that, in the first case, the ventricle became relaxed to its ordinary capacity after the heart had been a few days in maceration ; and that, in the second, the same effect was produced by the forcible introduction of the fingers.

Another inference from the preceding cases is, that enormous hypertrophy, unaccompanied by dilatation or by disease of the valves, does not produce any of the symptoms characteristic of an obstacle to the circulation through the heart. The true causes of these symptoms, when they exist in the heart, appear to be—

1. An increase in the volume of a cavity, relatively to the area of its discharging orifice, which renders necessary, as is evident from mechanical considerations, the exertion of greater force by the parietes to propel an equal quantity of blood with the same velocity.

2. Any obstruction from thickening or insufficiency of a valve.

(Obs. 116,) neither of them presenting any obstacle at the valves. In these there was no dilatation of the right cavities ; no dropsy ; there were depositions in the arteries, and dilatation of the orifice of the aorta in both ; cerebral apoplexy in both.

3. A want of power in the parietes of a ventricle to empty the cavity, from deficiency of energy, as in cases of chlorosis, &c.

In the details into which I have entered with respect to these cases, will be observed some points in common, which seem to indicate the circumstances favourable to this appearance of concentric hypertrophy.

1. *Age*.—Six of the eight cases occurred in persons who had passed the meridian of life; four in persons who had reached the age of sixty or more; and, with one exception, (Case 1,) the most marked cases occurred in the oldest persons. It is probable that the influence of age depends on its being favourable to hypertrophy. It appears from the researches of M. Bizot, published in the 1st vol. of *Mémoires de la Société d'Observation*, that the average thickness of the parietes of the heart increases up to the latest periods of life.

2. *Diseased Arteries*.—In six of these cases, there were considerable incrustations of the lining membrane of the arteries. This condition, by the resistance from friction which it offers to the course of the blood, is also a cause of hypertrophy.

3. *Smallness of the Aorta*.—This was met with in two cases (1 and 7). It occurred, with one exception, in the youngest persons, and seemed to make up for the influence of age and diseased arteries in producing hypertrophy.

The two preceding circumstances, which I have mentioned as favourable to hypertrophy, may be supposed to conduce rather to dilatation; but dilatation is almost always accompanied by hypertrophy, and an

obstacle, whose general tendency is to produce dilatation with hypertrophy, may be the occasional cause of hypertrophy without dilatation.

(In the treatise of M. Bouillaud there are, exclusive of cases of congenital malformation, fourteen cases in which the aortic orifice was contracted from disease of the valves; in twelve of these cases there was dilatation of the left ventricle; and in the remaining two, hypertrophy without dilatation.)

4. *Emaciation*.—The subjects of four of the eight cases were noticed as being thin. The smallness of the quantity of blood may reasonably be supposed to have had some influence in producing the appearance in question; and this supposition is sanctioned by the fact noticed by M. Jackson, in his report of cholera in Paris, in 1832, and which my own experience has recently confirmed, that the hearts of persons who die of this disease often present the appearance of concentric hypertrophy, and by the observation of M. Cruveilhier, to which I have before alluded, with respect to the hearts of persons who die by the guillotine.

5. *Mode of death*.—In four at least of these cases death occurred from apoplexy.

Let us now proceed to consider the six cases in which the concentric hypertrophy was accompanied by considerable valvular disease.

In the first, the mitral valve was thickened, and the leaf corresponding to the aortic orifice fibro-cartilaginous, but the valve was moveable, and completely closed the orifice, which was free. Concentric hypertrophy of the left ventricle *.

* Bouillaud, Obs, 119.

In the second, the mitral valves were shrivelled, and slightly cartilaginous ; there were warty growths on the aortic valves. Concentric hypertrophy of the left ventricle ; no dilatation of the right side ; no dropsy *.

The two preceding cases seem to favour the common hypothesis, that contraction of an orifice has a tendency to produce contraction of the cavity before it in the course of the circulation †.

In the third, there was cartilaginous inclination of the mitral and aortic valves ; concentric hypertrophy of the right ventricle ‡.

In the remaining three, there was concentric hypertrophy of both ventricles.

In one of these, (Case 4,) the mitral valve was generally thickened ; fibro-cartilaginous in many points ; not sensibly deformed ; the aortic valves were a little thickened, the tricuspid slightly thickened, especially at their extremities, but well formed and moveable §.

Case 5.—The mitral valve was a little shrivelled, thickened, and fibro-cartilaginous, but not much deformed. The tricuspid valves thickened, slightly cartilaginous at the free edge, well formed ||.

Case 6.—The mitral valves fibro-cartilaginous ; no affection of the tricuspid noticed ¶.

* Laennec, Obs. 50.

† Corvisart, Trans. p. 86. Med. Gaz. Vol. III. p. 371, Dr. Latham.

‡ Bouillaud, Obs. 123. Recorded by M. Bertin.

§ Bouillaud, Obs. 65.

|| Bouillaud, Obs. 133.

¶ Bouillaud, Obs. 134. Recorded by M. Bertin.

If in these cases it is not easy to shew that the affection did not exist during life, it is at least obvious that its origin cannot be explained on the hypothesis of an obstacle behind the cavity; for if the concentric hypertrophy of the left ventricle depended on the obstacle at the mitral valves, on what did that of the right ventricle depend? Surely not on the obstacle at the tricuspid valves, which were very slightly affected, and that only in two of the cases. Besides, observation teaches us, that contraction of an orifice has a very slight, if any, influence in producing contraction of the cavity *before* it in the course of the circulation.

(In the works of Bouillaud and Corvisart, there are twenty-five cases recorded of contraction of the mitral orifice, accompanied in most cases, certainly, by disease of the aortic valves; and in these twenty-five cases, contraction of the left ventricle did not once occur.)

In the last four cases, in which there was cartilaginous induration of the mitral or aortic valves, and concentric hypertrophy of the right ventricle, it seems probable that such an anomalous coincidence arose, not from a permanent, but from a temporary condition of the ventricle, which, in such cases, is almost universally dilated.

All the subjects in this category died of disease of the heart.

If we compare the cases in which the affection was unaccompanied by considerable obstacle from disease of the valves, with those in which such obstacle ex-

isted, we shall find that, in the first, there was no dropsy, no very evident signs of disease of the heart, and that neither of the patients died of a cardiac affection; that, of the others, there was dropsy in five cases; evident signs of the disease of the heart in all; and the disease of the heart the immediate cause of death in all. Now, the appearances of concentric hypertrophy were not more manifest in the second series than in the first.

If, then, the concentric hypertrophy observed in the second series was identical with that in the first, which it is fair to conclude for most of these cases, we must infer that the symptoms of disease of the heart, in the cases of the second series, did not result from the concentric hypertrophy, but from the valvular disease that accompanied it, and which was of itself, too, sufficient to account for such symptoms*.

The cases in which the appearances of concentric hypertrophy were observed, in conjunction with congenital malformation of the heart, still remain for our consideration.

In Case 1. A yellow, elastic membrane, having, at its centre, a permanent and oval aperture of $1\frac{1}{2}$ lines in diameter, represented the pulmonary valves; there were only three pulmonary veins. The right ventricle could scarcely hold the second phalanx of the thumb, its cavity being nearly obliterated by concen-

* It is from not having distinguished the cases in which it occurs in conjunction with diseased valves that some physicians have considered pericarditis as a cause of hypertrophy.

tric hypertrophy of the parietes, which, at the base, were nearly an inch in thickness *.

Case 2. At a small distance above the pulmonary valves, was a sort of diaphragm, perpendicular to the direction of the vessel, having an opening of about $2\frac{1}{2}$ lines in diameter. There was communication between the ventricles by a hole, perfectly round, 2 lines in diameter: the cavity of the right ventricle was very small, almost obliterated towards the point, to the height of two inches; the thickness of the parietes, partly the result of the development of the columnæ carneæ, was from 8 to 10 lines †.

Case 3. A sort of diaphragm, having at its centre a hole perfectly circular, of $2\frac{1}{2}$ lines in diameter, represented the pulmonary valves; the foramen ovale was open, and 4 lines in diameter. The right ventricle could just hold a pigeon's egg, and the thickness of its parietes varied from 11 to 16 lines ‡.

Case 4. A child three years old. It was necessary to use a probe to penetrate into the pulmonary artery, so great was the contraction of its orifice; the foramen ovale admitted a female sound; there was free communication between the ventricles, and an anomalous distribution of the arteries. The cavity of the right ventricle was contracted, and its parietes of considerable thickness §.

Case 5. A child who lived thirteen days. The

* M. Burnet. Obs. 77, of Bouillaud.

† Obs. of Louis. Obs. 76, of Bouillaud.

‡ M. Bertin. Obs. 75, of Bouillaud.

§ Corvisart, Trans. p. 261.

pulmonary artery was quite obliterated at its origin, and the foramen ovale was very large, so that all the blood of the right auricle passed immediately into the left. The right ventricle was almost a solid mass of flesh; there was scarcely any cavity. The ductus arteriosus appeared to be a branch of the aorta *.

In all these cases, then, there was a congenital obstruction at the pulmonary orifice, and in most of them there was, certainly, concentric hypertrophy of the right ventricle. In the last of these cases, the circumstance of the child's dying at the age of thirteen days, proves that in it the concentric hypertrophy was also congenital; and as most of the other cases presented characters similar, and differing only in degree, and as, in all, there was a malformation, evidently congenital, causing obstruction at the pulmonary orifice, the tendency of which would be to dilate the right ventricle, unless that ventricle were originally small in proportion to the pulmonary orifice, we must, I think, conclude that, in these cases, the concentric hypertrophy was also congenital.

With these may be classed the following case, which came under the observation of Dr. Sweatman; of a child who lived nine days, and during its life experienced great difficulty in breathing.

The left ventricle is almost a solid mass of flesh; the aortic orifice is so contracted as scarcely to admit the top of a probe; the left auricle is very small, with the exception of the auricular appendix, which is dilated. The foramen ovale is open. The cavity

* Dr. W. Hunter. Burns, p. 25.

of the right ventricle, which forms entirely the apex of the heart, is very large; its parietes not thickened. The cavity of the right auricle very large; its parietes thin. The tricuspid valves are replaced by a single membrane, which does not nearly close the orifice; there are two pillars attached to this membrane, one of them without any chordæ tendineæ. There are no pulmonary valves; the pulmonary artery is very large; the ductus arteriosus equal in volume to the aorta, at its junction with it.

In this case, the circulation was carried on almost wholly by the right ventricle, and that with very little assistance from the valves; the general circulation being supplied through the ductus arteriosus.

The preceding cases appear sufficient to prove that concentric hypertrophy of one of the ventricles of the heart, with obstruction at its discharging orifice, may exist as a congenital malformation, and that, in cases in which there is an extraordinary passage for the blood, through the foramen ovale or the ductus arteriosus, or by the communication between the ventricles, the natural thickness of the parietes may be increased five or six times, or even more; and that, generally, the right is the ventricle so affected.

The right auricle was much dilated in all these cases, except in that by Dr. Hunter, in which its condition was not mentioned. In Case 1, it was larger than the fist of an adult; in Case 4, as large as the rest of the heart.

The respective ages of the subjects of these cases are 7, 25, 57, and 3 years; 13, and 9 days; so that

with one exception, all these patients died young. The circumstances which I have just mentioned, establish important distinctions between these cases and those of the former categories, in which the affection occurred most frequently on the left side, and generally in persons advanced in life, and where the parietes were never much more than doubled in thickness.

Recapitulation.—I. That there was no permanent diminution of the cavity during life, in the cases recorded of concentric hypertrophy of one of the ventricles unconnected with valvular disease, may be inferred from the following circumstances :

1. That similar appearances have been observed by M. Cruveilhier in the hearts of persons who died by the guillotine ; and, by Mr. Jackson and others, in subjects whose death had been caused by cholera.

2. That in these cases the symptoms of cardiac disease were slight, and no other than those which indicate simple hypertrophy ; and that there was no intermittence or irregularity of the pulse, no dilatation of the right cavities or dropsy ; symptoms of obstacle to the circulation through the heart, which must have occurred had the cavity during life been so small as it appeared to be.

3. That, in two of the cases, the cavity was restored, by mechanical means, to its normal size ; and that in none was there any obstacle behind it, by which its permanent diminution could be explained.

4. That the supposition of increased strength of the parietes with diminution of the cavity, and that,

too, relatively to the area of its discharging orifice, is opposed by the mechanical considerations by which we account for the almost constant occurrence of hypertrophy in cases of dilatation.

II. In the six cases complicated by extensive valvular disease, the diminution of the cavity cannot be explained by the hypothesis of an obstacle behind it; and, in some of these cases, the existence of an obstacle before it renders it highly probable that this diminution was merely a passing condition of the ventricle: and, as the appearances of concentric hypertrophy were not more marked in these cases than in those of the former category, and as the symptoms of obstacle to the circulation, observed in these cases, were such as would result from the diseased valves alone, we cannot admit the existence of concentric hypertrophy in the category we are now considering.

III. Concentric hypertrophy of a ventricle, in a high degree, with obstruction at its discharging orifice, and an extraordinary passage for the blood, occasionally exists as a congenital malformation, and, in most cases, the right is the ventricle so affected.

IV. Hypertrophy of the heart, to whatever extent it exists, when it is exempt from dilatation of the cavities, and from disease of the valves, does not produce any of the symptoms of an obstacle to the circulation through the heart.

Bedford Place,
April, 1838.